Small Business Innovation Research/Small Business Tech Transfer

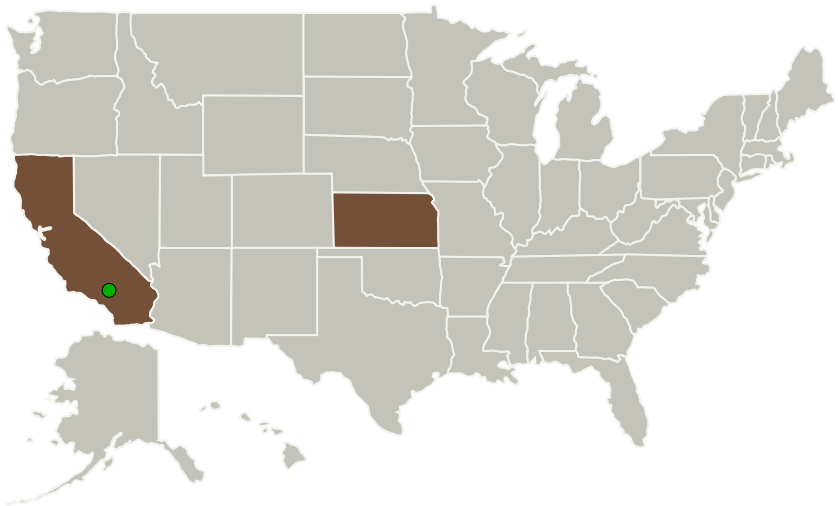
Collision-Avoidance Radar for Small UAS, Phase II

Completed Technology Project (2016 - 2018)

Project Introduction

In the near future unmanned aircraft systems (UAS) will be utilized for many societal and commercial applications. However, the hurdle of operation safety in the form of avoiding airborne collisions must first be overcome. UAVradars LLC is proposing a small, lightweight, and low-power radar system designed specifically to give small UAS (< 55 lbs) airborne collision-avoidance sensory capability. Radar is ideally suited for this purpose due to its all-weather capability to provide accurate position and velocity data. The proposed radar is based on previous R&D funded by NASA and performed at the University of Kansas from 2012 to 2014. This effort resulted the successfully flight testing of a large scale proof-of-concept radar that was then miniaturized as an academic demonstrating of the potential reduction in size, weight and power (SWaP). The SBIR Phase I focuses on overcoming critical factors specific to commercialization needs that were left unresolved. These were 1) replace the bulky user laptop controller with a small Raspberry Pi 2 to allow the miniature radar system to be installed on a sUAS; 2) move the radar operations to the ISM band to avoid FCC licensing complications; and 3) implement radar transmit encoding to allow multiple radar systems to operate in the same area without cross jamming. The successful complete of Phase I indicated the radar commercialization feasibility which leads into Phase II. The objectives in Phase II is to create a flight tested prototype. This involves 1) maximize radar hardware performance; 2) create a target detection and tracking algorithm; and 3) perform radar flight testing to validate its capability. By completing these tasks, the Phase II miniature radar system will be proven as a disruptive technology for overcome key sense-and-avoid barriers in NASA?s efforts of integrating UAS in the National Airspace System (NAS).

Primary U.S. Work Locations and Key Partners



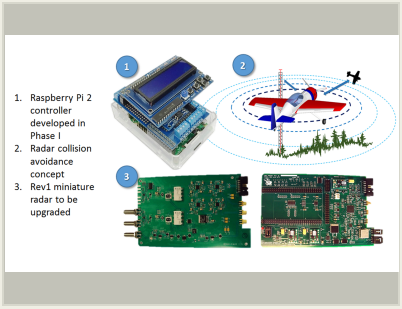


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Table of Contents

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Organizations Performing Work	Role	Type	Location
UAVradars, LLC	Lead Organization	Industry Minority-Owned Business	Lawrence, Kansas
Armstrong Flight Research Center(AFRC)	Supporting Organization	NASA Center	Edwards, California

Primary U.S. Work Locations	
California	Kansas

Project Transitions

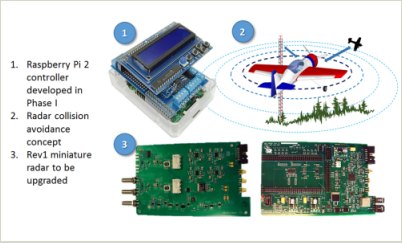
May 2016: Project Start

May 2018: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139541)*

Images



Briefing Chart Image
Collision-avoidance radar for small UAS, Phase II
(https://techport.nasa.gov/image/126443)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
UAVradars, LLC

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Shi Lei

Co-Investigator:
Lei Shi

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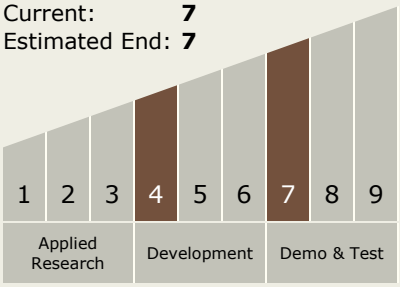
Technology Maturity (TRL)

Start: **4**
Current: **7**
Estimated End: **7**



Technology Areas

Primary:

- TX10 Autonomous Systems
  - TX10.1 Situational and Self Awareness
    - TX10.1.1 Sensing and Perception for Autonomous Systems

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System